Limited Reconnaissance Options (Generally Level 2)

If recreation opportunities are flow-dependent but lack precise information about flow needs or project effects, some on-site (field) reconnaissance is typically needed. Several options are described below, offering distinct ways of enhancing information developed in Level 1. Study options for boating, fishability, and other types of recreation are discussed separately.

A limited reconnaissance of the Middle Klamath River at 650 cfs suppplemented interview information about flow ranges for different types of boating. This was a marginal flow for technical rafting through narrow rapids such as Dragon's Tooth.

On-Land Boating Feasibility Assessment

Objective
Assess the feasibility and potential quality of boating opportunities, and estimate rough flow ranges by scouting a reach (or reaches) from on-land (or by wading the channel if flows are low enough). These usually occur when the reach has no history of previous boating use.

Typical approach
Identify a short list of experienced boaters and agency staff familiar with the river to participate in the reconnaissance. Develop an evaluation form to address issues identified in Level 1. Conduct the reconnaissance by walking or driving along the reach, encouraging discussion among participants. Summarize opinions about the feasibility of boating, types of opportunities, possible flow ranges, and potential project effects.

Product
Summary of reconnaissance effort and findings. Lists of participants, evaluation results, and discussion notes may be provided in appendices.

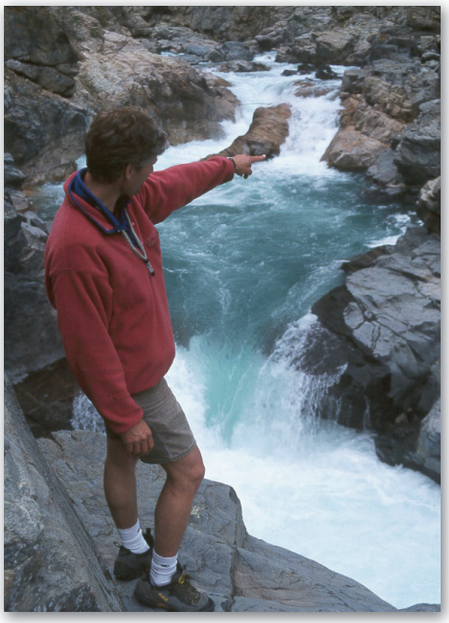
Responsibilities
Utilities (or their consultants) have primary responsibility, but agencies and stakeholders commonly participate in the reconnaissance and may be asked to formally evaluate reaches, opportunities, or flows. Recreation groups can provide valuable assistance rounding up participants. If an evaluation form is developed, working groups typically review the format and content. Logistics for the reconnaissance are usually worked out among participating utilities, agencies, and stakeholders (see sidebar on fieldwork roles and responsibilities).

Additional issues
Composition of the participants is critical. The number of participants may be small, but they should represent the diversity of recreation opportunities likely to be at issue on the reach. Stakeholder and agency agreement on composition may be useful.

Evaluating a dry or nearly dry bypass reach may be challenging, so there are advantages to scheduling reconnaissance during potentially boatable flows if possible. In some cases, flow releases for the reconnaissance may be arranged, and they can dramatically increase the power of these assessments.

The reconnaissance may lay the logistical groundwork for more detailed study at a later date. On-land boating assessments also may be a planned interim step when a controlled flow study is expected; in these cases, fewer participants and a professional judgment-level analysis rather than formalized evaluations may be sufficient and will minimize costs.

Cautions & limitations
On-land boating assessments may suggest whether a river is boatable, but they are unlikely to provide precise assessments of flow ranges. They are helpful for assessing safety issues for an on-water assessment and narrowing flow ranges for additional study, particularly on more challenging (higher gradient) rivers.



Left: An on-land study on Washington's Chelan River helped determine if whether boating was feasible in a gorge with limited access and a gradiant over 400 feet per mile. After observing three flows in a single day, participants recommended an on-water controlled flow study.

Below: During an on-land boating feasibility study, participants hiked Alaska's Cooper Creek (below) at approximately 60 cfs. Four waterfalls (inset) were not boatable, but some sections would provide Class III-IV opportunities at flows over 100 cfs. Challenging access, the short length, and several better alternatives in the region would limit demand, so an on-water boating study was unnecessary.

Below: During the subsequent boating study on the Chelan River, kayakers successfully ran the gorge at 275, 390 and 475 cfs. A settlement agreement between the utility and stakeholders provides for boating flows in the future.

On-Water Boating Feasibility Assessment

Objective
Assess the feasibility and potential quality of boating opportunities and estimate flow ranges by boating the river at a single flow.

Typical approach
Similar to an on-land boating assessment, experienced boaters usually participate in the reconnaissance, and an evaluation form may be developed to quantify findings. The difference is that the reconnaissance includes boating on the reach. Focus group discussion after the run is used to summarize opinions about the feasibility of boating, types of opportunities, possible flow ranges, and potential project effects.

Product
Summary of reconnaissance effort and findings. List of participants, evaluation results, and discussion notes may be provided in appendices.

Responsibilities
As with on-land boating assessments, utilities (or their consultants) have primary responsibility, but agencies and stakeholders commonly participate in fieldwork and review the evaluation form. Recreation groups can provide valuable assistance rounding up participants.

Additional issues
As with on-land boating assessments, composition of the participants is critical and may be improved with stakeholder and agency review.

Safety and liability issues may be important, particularly on reaches that have had little or no previous boating use, or have more challenging whitewater (see sidebar on safety and liability).

On-water boating assessments may be a planned interim step when a controlled flow study is planned; when this occurs, fewer participants and a professional judgment-level analysis rather than formalized evaluations may be sufficient and minimize costs. The feasibility assessment may lay groundwork or provide valuable logistical information for later in-depth studies.

Cautions & limitations
On-water boating feasibility assessments at a single flow may demonstrate whether boating is possible, but they are unlikely to provide precise estimates of flow ranges for boating (unless the range is narrow and reconnaissance fortuitously occurred within that range).

An on-water boating study on the Lower Carmen Bypass Reach on Oregon's McKenzie River was conducted at 330 cfs. Kayakers successfully boated the reach, but the short run had difficult access, many log portages, and less-interesting-than-expected whitewater. Additional boating studies were not recommended.

Single Flow Fishability Assessment

Objective
Assess the potential quality of fishing opportunities, and estimate flow ranges, through reconnaissance of the river at a single flow.

Typical approach
Parallel to boating feasibility assessments, experienced anglers usually participate in the reconnaissance, and an evaluation form may be used. Focus group discussion after reconnaissance helps summarize opinions about the likely availability of different fishing opportunities (defined by species, tackle, and technique), possible flow ranges, and potential project effects.

Product
Summary of reconnaissance effort and consensus findings. Lists of participants, evaluation results, and discussion notes may be provided in appendices.

Responsibilities
Utilities (or their consultants) have primary responsibility, but agencies and stakeholders commonly participate in fieldwork and review the evaluation form or list of participants.

Additional issues
Fishability assessments typically occur from land, but it may be useful to have anglers wade or boat the river if those are a common component of target opportunities.

It is challenging to assess a diversity of potential fishing locations during a short assessment period (a few hours or a day). Similarly, there are trade-offs between the number of sites and the quality of assessments, or between organized visits to specific locations and more "freelance" evaluations by individual anglers. These decisions are typically made on a case-by-case basis after considering segment characteristics, likely fishing opportunities, existing use, or other factors.

Fishability assessments may be unnecessary or less formal if a controlled flow study is expected, or anglers currently use a reach (and work can document their use patterns and flow ranges of interest). Unlike boating, the "feasibility" of fishing is usually not in question; the focus is on the quality of access to fishable water at different flows.

As with boating feasibility assessments, composition of the participants is important and may be improved by including local area guides or review by stakeholders and agencies.

Fishing assessments need to address potentially confounding evaluation issues related to longer-term fishing success or the condition of the fishery. For more information, see sidebar on "fishability, fishing, and the fishery."

Cautions & limitations
Fishability assessments at a single flow may be able to demonstrate whether a flow provides fishable water, but they are unlikely to provide precise flow ranges for different opportunities (unless the range is narrow and a flow in that range was assessed).

Fishability studies are only one component of assessing flow needs for fishing opportunities. Fishability studies generally focus on access to fishable water, offering less information about long term fishing success or effects on the fishery (see sidebar on these distinctions).

Flows for boat-based fishing may be different from flows for wading or shore-based fishing.

Right: Situk River, Alaska, where most anglers wade, but some use boats to access fishing areas.

Single Flow "Expert Judgment" Assessments for Other Recreation Opportunities

Objective
Assess the potential quality of other recreation opportunities such as swimming, tubing, or general riverside recreation, and estimate flow ranges from reconnaissance at a single flow. The types of recreation considered in these studies are rarely associated with organized advocacy groups, but they are represented by NPS in relicensing proceedings.

Typical approach
Similar to single flow boating and fishability assessments, these reconnaissance-based efforts usually involve on-site evaluations by recreation consultants familiar with the target opportunities. Participation by swimmers, tubers, or others is not common, but could be incorporated. Photos of key sites and conditions, along with rough measurements of key features (e.g., pools, current speed) are useful. If participants are involved, focus groups would also occur.

Product
Summary of reconnaissance effort and findings. A list of participants, evaluation results, photos, measurements, and discussion notes may be provided in appendices.

Responsibilities
As with other feasibility assessments, utilities (or their consultants) have primary responsibility, but agencies and stakeholders commonly participate in fieldwork and review the evaluation form.

Additional issues
Participants in these activities may not be particularly flow-sensitive, so their participation is optional. However, interviews with local swimmers or tubers about their activities can be important. Defining target opportunities with sufficient specificity is probably the critical step, and can be enhanced with interview information from agencies or local users. These assessments typically occur from the shore in tandem with assessment efforts for boating and fishing. There are logistical challenges to conducting comprehensive assessments for multiple activities in a single reconnaissance.

Simple measurements of pool areas, depths, or current velocities may enhance descriptions of recreation opportunities or conditions created by flows.

There are challenges assessing a diversity of potential recreation locations during a short assessment period, with trade-offs between quantity and quality. Identifying representative locations or reaches for swimming or tubing evaluations may increase efficiency, but assumes homogeneity among locations.

Feasibility assessments for other recreation opportunities may be unnecessary if a controlled flow study is planned, or people currently use a reach for swimming, tubing, or other recreation (and can describe their use patterns and flow ranges of interest). For some opportunities, having evaluators swim or tube a reach may be useful.

Cautions & limitations
Expert judgment assessments at a single flow may ascertain whether particular activities are possible, but they are unlikely to provide precise flow ranges for opportunities (unless the range is narrow and a flow in that range was assessed).

Tubers on California's Lower Kern River illustrate differences betwen relaxed floating (bottom photo) and more challenging tubing (top photo) that have different flow needs.

Swimming areas on many rivers include "jumping rocks" that require adequate pool depths for safety. Measuring pool depths at different flows can help researchers determine how flows affect these kinds of opportunities. Above: Oregon's Rogue River

General riverside recreation is usually "enhanced" by flows rather than "dependent" on them. Left: Waders and swimmers at an undeveloped recreation area on California's Lower Kern River at 400 cfs. These activities were observed at study flows ranging from 400 to 1,200 cfs.

SIDEBAR

Flow Regimes, Long-Term Effects, and Recreation

Most of the studies in this document focus on short-term or direct effects of flows on recreation, but long-term or indirect effects of flow regimes can also be substantial (Shelby et al., 1992; Whittaker et al., 1993). For example, flow regimes may affect riparian vegetation and the extent to which it encroaches on the river channel; the size, frequency, and distribution of beaches or other channel features; water quality; and aquatic and terrestrial species that use these ecosystems. These in turn affect "habitats" for boating, angling, camping, bird watching or other recreation activities.

It is beyond the scope of this document to review research on this wide range of long-term effects; each area has a well-developed literature and research protocols. In addition, many of these biological and physical resources receive considerable attention in relicensing or other regulated river decision-making. But connections between their work and recreation impacts are seldom carefully developed or made explicit, even though effects can be profound.

A few issues deserve consideration as river professionals look for ways to integrate findings from long-term biophysical studies with recreation information.

First, most long-term effects are not observable through reconnaissance-based or controlled flow studies, so assessing these effects may default to a comparison of current and pre-project conditions (to the extent these are even known). This may be helpful for describing how the current regime has altered the biophysical environment, but it is less useful for describing the effects of alternative future operation regimes and the "habitats" they may create.

Second, recreation controlled flow studies focused largely on short term effects typically release flows well below bankfull levels, so they are probably not capable of triggering substantial geomorphic or riparian vegetation changes that researchers can study. Controlled flow studies can help model biological or physical responses to new flow regimes, but their findings depend upon the accuracy of model "assumptions." For example, fish habitat modeling has become more sophisticated during the past twenty years, but it may take multiple years before some population-level effects can even be detected, and research that verifies model precision has been sparse. Similarly, while sediment transfer and beach-building studies in Grand Canyon have been intensive and illuminating, experimental "floods" or revised operating regimes have yet to dramatically restore

Beaches provide "recreation habitat' for camping and swimming. High flows and sediment sources are needed to clean and replenish beaches, a biophysical process often affected by water development.

Above: The number and size of beaches in Grand Canyon have decreased since Glen Canyon Dam was built.

Low flow regimes can produce warm temperatures with impacts such as stagnant pools and algae blooms.

Left: California's Klamath River.

Years of low flows allow vegetation to encroach on river channels, which may affect boating safety or casting space for anglers.

Right: Vegetation obstructed visibility and blocked boating routes in California's Pit 5 Bypass Reach at 250 cfs.

beaches and other geomorphic features, and no work has addressed direct connections between these features and the quality of recreation experiences in the canyon (GCMRC, 2005).

There is a need for more research into how recreation users evaluate biological and physical conditions affected by flow regimes. For example, social science studies can identify important biophysical attributes for certain activities, compare different beach sizes or camp environments, or assess trade-offs between different types of fisheries. However, to do so they need biological and physical scientists to specify alternative futures under different flow regimes. Our experience with interdisciplinary studies suggests it will be challenging to get agreement about those potential futures, even for the purposes of studying recreation users' evaluations.

There may be reasons for restoring certain riparian vegetation types, geomorphic features, or associated biological communities to a "natural" condition, but it should not be assumed that this is possible or even desirable in all cases. On regulated rivers, all alternative flow regimes are essentially "designed" or "artificial," and it may not make sense to consider the pre-project regime as the "standard." In most cases, the trade-offs are between alternative futures with different resource conditions and ecologies, or between different combinations of recreation opportunities (Schmidt et al., 1998); a priori value judgments that label certain combinations as being more "natural" is not a scientific position. There may be good reasons to recover specific ecological attributes that were present pre-project, but these goals need to be specified explicitly rather than assumed as "inherently better."

Flow regimes have long term effects on biophysical resources such as fisheries. Modeling helps identify flow regimes to improve habitat, but doesn't predict specific changes in fish populations or anglers' fishing success.

Above: Bull trout are threatened on some western rivers, where relicensing efforts may suggest habitat improvements.

Documentation Needs and Explicit Criteria for Progressing to Level 3 Studies

A Level 2 report should document reconnaissance efforts and findings, possibly integrating them with Level 1 information in a single revised report. Major sections need to identify specific recreation opportunities, identify flow-dependent attributes, identify rough flow ranges (if possible), and assess whether project operations are likely to have impacts on those opportunities.

Agency and stakeholder review is important, and may be implemented differently in traditional, alternative, or integrated planning processes. Earlier reporting allows more time to plan additional work (if needed) or integrate findings with work from other resource areas.

The report should include explicit decisions about whether additional study is necessary for each opportunity and reach. The utility and consultants typically outline the issues in the report, but review by agencies and stakeholders (via working groups) can make those decisions more collaborative, or identify disputes.

Deciding whether to launch more intensive Level 3 studies is the critical study output; this depends on answers to the same questions discussed for the adequacy of Level 1 efforts. For opportunities where users are relatively insensitive to flows, or where project effects do not appear substantial, Level 2 information is likely to be sufficient. However, if project operations are likely to have direct and noticeable effects and flow regime changes are possible, greater precision may be necessary.

Intensive Study Options (Level 3)

For opportunities that are obviously flow-dependent and where precise information about flow needs or project effects is needed, more intensive effort is recommended. Several options for different types of recreation studies are described below.

Multiple Flow Reconnaissance Assessments

Objective
Improve precision of estimated flow ranges for recreation opportunities by assessing multiple flows. Generally applicable to boating, fishing, tubing, or swimming on reaches with logistical complications that prevent evaluations associated with controlled flow studies (see additional issues below).

Typical approach
Similar to single flow assessments, these differ by assessing multiple flows. Participation by recreation users is typically limited (see controlled flow studies below), but may be important. Quantitative ratings (by panels or experts) are commonly made for all relevant opportunities and conditions. Photos of key sites and conditions, along with rough measurements of key features (e.g., pools, current speed) may be useful, particularly for non-boating and fishing conditions. Qualitative notes or focus group discussions after are used to summarize opinions about the feasibility or quality of different types of opportunities at different flows.

Product
Summary of reconnaissance efforts and findings. A list of participants, evaluation results, photos, measurements, and discussion notes may be provided in appendices. Usually presented in a report that is supplemental to Phase 1 and 2 reports.

Responsibilities
As with other assessments, utilities (or their consultants) have primary responsibility, but agencies and stakeholders commonly participate in fieldwork and review evaluation forms.

Additional issues
Multiple-flow assessments that rely on expert judgments usually occur when logistical constraints make it difficult to assemble or maintain an evaluation panel. Example problems might include the inability to control flows (necessitating opportunistic fieldwork when natural flows are close to target levels) or difficult access to the river reaches. For some opportunities, potential participants (e.g., tubers or swimmers) may not be particularly sensitive to flow changes (or able to express preferences for specific flows), so it may be efficient and effective to have experts evaluate key conditions (which assumes the need to carefully document conditions and assumptions).

Multiple-flow assessments often focus on more than one recreation activity, which may present logistical challenges. Given trade-offs between the number of sites that can be assessed and the quality of assessments, identifying representative locations or reaches for more intensive work is critical.

Choosing the number and increments of flows is a case-by-case decision that generally depends on Phase 1 and 2 findings and requests from other resource areas (fisheries, etc.). Assessments of two to four flows are common.

Cautions & limitations
Expert judgments are often sufficient when supported with clear documentation of conditions at different flows, but user, agency, or stakeholder participation is important and powerful.